

Mandatory Reporting of Greenhouse Gas Emissions for Cogeneration Facilities

California Global Warming Solutions Act of 2006 (AB 32)

December 4, 2008
Sacramento, California



Participation Information

- Workshop materials and Guidance:
<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>
- Regulation and Final Statement of Reasons:
<http://www.arb.ca.gov/regact/2007/GHG2007/GHG2007.htm>
- Webinar information for Cogeneration Sector:
<https://www2.gotomeeting.com/register/213697878>
Phone Dial-In: 312-878-0211 Access Code: 171-125-566



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Agenda

- Mandatory reporting implementation
- Review of general requirements
- Steps of reporting for cogeneration facilities
- Distributing emissions



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Mandatory Reporting Rulemaking Process

- Regulation approved by Board December 2007
- Modifications released for comment
- Final Statement of Reasons (FSOR) completed October 2008
- OAL approval December 2, 2008



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Coordination with Future Regulations

- ARB Scoping Plan
- U.S. EPA Mandatory Reporting
- WCI Regional Reporting

ARB Instructional Guidance for Reporting

- Instructional guidance document available at
<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>
- Provides explanatory detail and examples, suggested best practices
- Not a substitute for the regulation

ARB's GHG Reporting Tool

- ARB providing web-based platform for GHG reporting
 - Available January 2009
- Reporting tool demonstration workshop
 - December 19, 2008, 10:00 – 1:00

Review of General Reporting Requirements

Who's Responsible for Reporting?

- At facilities, the entity with operational control
- For electricity transactions, a retail provider, marketer, or facility operator

Exempt from Reporting

- Primary and secondary schools
- Hospitals
- Nuclear, hydroelectric, wind and solar power plant (except hybrids)
- Portable equipment
- Backup or emergency generators (permitted by air districts)

What Sources Are Reported

- Stationary combustion
- Process and fugitive emissions when specified
- Mobile emissions optional
- Indirect energy usage

What Gases Are Reported

- CO₂, CH₄, N₂O
- CO₂ from biomass fuels tracked separately
- HFCs, SF₆, PFCs where specified

Preparing for 2009 Reports

- Must report 2008 emissions in 2009
- 2009 reports should be complete
- Emissions calculations may be based on best available data and methods
 - Regulation methods preferred
- Verification is optional for 2009 emissions reports

Preparing for 2010 Reports

- 2010 emissions data report must meet full requirements of the regulation
- Monitoring equipment should be in place by January 1, 2009
- Everyone must verify their 2009 emissions data reports in 2010

Reporting Schedules

- Power and cogen plants within larger facilities/entities are on the larger facility/entity schedule
- Other power and cogen plants and most general combustion facilities report by April 1
- Other facilities (including oil & gas) and entities report by June 1

Fuel Analytical Data Capture

- Data collected to support calculations of GHG combustion emissions
 - Mass, volume, flow rate, heat content, carbon content
- Need 80% capture rate for source verification
- For <20% missing data:
 - Use 40 CFR Part 75/60 if applicable
 - Use mean of data captured if not

Fuel Use Measurement Accuracy

- Measurement procedures must assure fuel use is quantified within $\pm 5\%$ accuracy
- Maintain and calibrate devices to achieve $\pm 5\%$ accuracy
- Quarterly calibrations of operators' solid fuel scales
- Keep records for verification

Interim Data Collection Procedure

- ARB EO can approve interim procedure if fuel monitoring equipment breaks down
- When breakdown will result in $>20\%$ data loss for report year
- Limitations and procedure in section 95103

Using CEMS

- CEMS may be used to calculate combustion and process CO_2 emissions in most cases
- Operators may install new CEMS prior to January 2011
 - Meet 40 CFR Part 75 requirements
- Operators must choose between CEMS and fuel-based options for consistent reporting

Reporting *de minimis* emissions

- Sources $\leq 3\%$ of facility emissions, not to exceed 20,000 MT CO_2e
- Still reported, but may be estimated using alternative methods

Data Completeness, Record Keeping

- Retain documents on GHG inventory design, development and maintenance for five years
- Implement internal audit and QA for reporting program
- Log changes in accounting methods, instrumentation
- Specifications in sections 95104-95105

Third Party Verification

- Optional for 2009 emissions reports
- Required beginning in 2010
- Verification opinion due 6 months after report submittal

Verification Key Steps

- Reporter contacts ARB-accredited verification body (VB)
- VB submits COI assessment to ARB
- Verification conducted following ARB OK
- Verification results discussed with reporter
- Reporter may revise report if time permits
- Verification body submits verification opinion to ARB and reporter

Verification Oversight

- ARB will provide training and accredit verifiers and verification bodies in 2009
- Verification process will assist compliance efforts and assure quality data
- Targeted review of submitted data and verifiers
- ARB responsible for enforcing regulation

Reporting for Cogeneration Facilities

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Preparing for Reporting, Six Basic Steps

- 1) Determine whether you need to report—Guidance Chapter 2
- 2) Determine reporting and verification deadlines—Guidance Chapter 3
- 3) Design a GHG inventory management program—Guidance Chapter 4

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Preparing for Reporting, Six Basic Steps (continued)

- 4) Set up and document GHG calculation methods—Chapters 5, 8, 9, 13
- 5) Collect and record required data; generate and submit your GHG emissions data report—Chapters 8, 9, 13
- 6) Contract with a verifier and initiate verification (optional in 2009, required in 2010)—Chapter 6

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Step 1: Determine whether you need to report

Definition of a cogeneration facility:

- May include one or more cogeneration systems
- Provides sequential generation of useful thermal energy and electricity in single, integrated systems
- May be configured as topping or bottoming cycle

Facility-level reporting thresholds:

- Facility nameplate generating capacity ≥ 1 MW
AND
- Emit $\geq 2,500$ MT of CO₂
 - from electricity-generating activities
 - in any calendar year after 2007



Example: how operational control affects applicability

A hospital has a cogeneration system on-site.

- Nameplate generating capacity is at least 1MW.
- Emissions associated with electricity generation > 2,500 MT CO₂.

Case A The cogeneration system is under operational control of the hospital.

→ Because the hospital is exempt, no reporting obligation.

Case B A separate entity owns and operates the cogeneration system. Or, a separate entity shares operational control with the hospital, and holds the permit to operate.

→ Cogeneration facility operator submits report to ARB.



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Step 1: Determine whether you need to report

- 1) Determine CO₂ emissions from electricity-generating activities

→ Use specified equations to distribute CO₂ emissions

- 2) Compare to reporting threshold: $\geq 2,500$ MT of CO₂

Step 1: Determine whether you need to report

When comparing to the reporting threshold, include CO₂ emissions from

- stationary combustion of biomass-derived and fossil fuels
- supplemental firing in the duct burner of the heat recovery steam generator, if applicable
- stationary combustion that generates waste heat recovered for electricity production in bottoming cycle plants
- process CO₂ emissions from acid gas scrubbers, if applicable

Step 1: Determine whether you need to report

When comparing to the reporting threshold, do not include

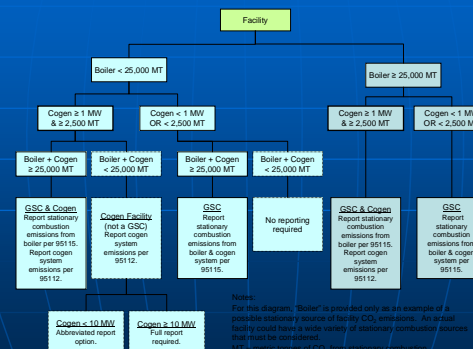
- pass-through CO₂ emissions associated with biogas generation and combustion
- fugitive or mobile emissions
- indirect emissions associated with purchased electricity or thermal energy

Primary and secondary sector considerations

- Cement plants
- Petroleum refineries
≥25,000 MT CO₂ in a calendar year
- Hydrogen plants
≥25,000 MT CO₂ in a calendar year
- Electricity generating facilities
≥ 1 MW and ≥2,500 MT CO₂ in a calendar year
- Other industrial facilities -
“general stationary combustion facilities”
≥25,000 MT CO₂ in a calendar year

Primary and secondary sector considerations

Figure 12.1. Stationary Combustion and Cogeneration Reporting Applicability



Step 2: Determine reporting and verification deadlines

- Cogeneration plants within larger facilities/entities that are subject to reporting report and verify on the schedule of the larger facility/entity
- Other cogen plants report by April 1 and verify by October 1

Step 3: Design a GHG Inventory Management Program

Emissions data report for cogeneration facilities, section 95112(a)

- Facility- and generating unit-level info.
- Cogeneration system description
- Electricity generation and end-use
- Thermal energy production and end-use
- Distributed emissions
- Abbrev. report for specified facilities

Step 4: Set up and document GHG calculation methods

General Information Reported

- Direct stationary combustion emissions: CO₂, CH₄, N₂O by fuel type
 - CO₂ from biomass-derived fuels separate
- Specified process and fugitive emissions: CO₂, SF₆, HFCs, CH₄
- Fuel consumption by fuel type
- Indirect emissions, electricity in kWh
- Mobile emissions optional

Step 4: Set up and document GHG calculation methods

	Electrical Generating Facilities & Retail Providers	Cogeneration
Reporting Requirements Section in Regulation	95111	95112
CO₂ Emissions From Combustion	See ARB Guidance, Table 8.8 Matrix of Methodologies	
Associated Gas		
Biomass and Landfill Gas	95125(c)-(d) or (g)	95125(c)-(d) or (g)
Biomass Fuels	95125(g) CO ₂ CEMS if available; if not then (c)-(d) or (g)-(h)	95125(g) CO ₂ CEMS if available; if not then (c)-(d) or (g)-(h)
Coal and Petroleum Coke	40 CFR Part 75 if applicable (includes App G); if not then 95125(d) or (g)	40 CFR Part 75 if applicable (includes App G); if not then 95125(d) or (g)
Flexigas	95125(d)(3)(A) or (g)	95125(d)(3)(A) or (g)
Middle Distillates, Gasoline, Residual Oil, or Gas (LPG)	40 CFR Part 75 if applicable; if not then 95125(c)-(d) or (g)	40 CFR Part 75 if applicable; if not then 95125(c)-(d) or (g)
Liquefied Petroleum Gas (LPG)		

Step 4: Set up and document GHG calculation methods

Emissions calculations by fuel type

- CO₂ methods
 - 40 CFR Part 75 - data sent to U.S. EPA
 - 95125(c) - measured heat content
 - 95125(d) - measured carbon content
 - 95125(g) - CEMS CO₂ or O₂
 - 95125(h) - measured steam or source-specific EF
- N₂O and CH₄ methods, 95125(b)
 - Default emission factor
 - Measured heat content
 - Source-specific emission factor

Step 4: Set up and document GHG calculation methods

Options to Develop Source-specific Emission Factors (EFs)

- Source Test Plans approved by ARB
- N₂O and CH₄ source-specific EFs
 - Option for all facilities
- CO₂ source-specific EFs
 - Option for facilities that combust biomass solid fuels, MSW, or waste-derived fuels; also geothermal

Source Test Process

- Prepare source test plan
 - See ARB guidance for template
 - Include test methods, schedule, sampling locations, QA/QC, etc.
- Submit plan to ARB for approval
- On approval, perform testing, providing ARB and air district notification of test dates for possible agency participation
- Using valid test data, develop appropriate emission factor(s)



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Planning for Source Testing

- Schedule enough time for test plan preparation, approval, on-site testing, and data analysis
- GHG reporting deadlines cannot be delayed if source test data are not ready
 - Use other specified estimation methods in regulation if source test data not available
- ARB staff is providing written guidance and resources



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Step 5: Collect and record required data; generate & submit report

- Assure ARB has correct contact information.
- Gain familiarity with ARB's on-line reporting tool
- Enter data into the appropriate data fields provided in the tool.
- Tool will have limited calculation functions, or the reporter may override the calculating tool and enter the data directly.



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Distributing CO₂ Emissions

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Distributing CO₂ Emissions: General Procedure (1)

- 1) Determine the total direct CO₂ emissions from stationary combustion for the cogeneration system. For bottoming cycle plants, include the combustion source for the manufacturing process that generates the initial waste heat.
- 2) Determine energy flows for the cogeneration system configuration expressed in MMBtus, including output flows of useful thermal energy and electric energy. For bottoming cycle plants, input fuel energy is required.



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Distributing CO₂ Emissions: General Procedure (2)

- 3) Determine the efficiencies of thermal energy and electricity production.
- 4) Determine the fraction of emissions allocated to thermal energy production and electricity generation and report the distributed emissions. For bottoming cycle plants, include emissions allocated to the manufacturing process.



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Distributing CO₂ Emissions: General Procedure (3)

When reporting distributed emissions,

- Include CO₂ emissions from
 - stationary combustion of fossil fuels only
 - supplemental firing in the duct burner of the heat recovery steam generator, if applicable
 - stationary combustion that generates waste heat recovered for electricity production in bottoming cycle plants

Distributing CO₂ Emissions: General Procedure (4)

When reporting distributed emissions,

- Do not include
 - stationary combustion of biomass-derived fuels
 - pass-through CO₂ emissions associated with biogas generation and combustion
 - process CO₂ emissions from acid gas scrubbers
 - fugitive or mobile emissions
 - indirect emissions associated with purchased electricity or thermal energy

Distributing CO₂ Emissions: General Procedure (5)

Reporting distributed emissions when combusting both biomass-derived and fossil fuels:

- Distribute fossil fuel emissions when above *de minimis*.
- CO₂ emissions from biomass-derived fuels, including pass-through emissions, are reported, but not distributed.

Distributing CO₂ Emissions: General Procedure (6)

Reporting distributed emissions when combusting both biomass-derived and fossil fuels:

- Parameters are based on total energy flows from combustion of both fuel types.
- In the final distribution, the fractions of emissions determined are multiplied by the CO₂ emissions from fossil fuel combustion only (E_T), to calculate E_H , E_P , and for bottoming cycle plants E_M .

Types of Cogeneration

Topping Cycle Plants

- Energy input used to produce useful power output
- Waste heat used to provide useful thermal energy

Bottoming Cycle Plants

- Energy input applied to useful thermal energy application or process
- Waste heat used for power production

Distributed Emissions—General Procedure: Topping Cycle Data

Required Data	Optional data	Units	Data Source
$E_{T\text{CO}_2}$ - Total direct CO ₂ emissions from the cogeneration system from stationary combustion		MT	operator measured - determine CO ₂ emissions based on fuel quantities and fuel types or CEMS.
H - total useful thermal output		MMBtu	operator measured
P_{MWh} - power generated	See ARB Guidance, Table 9.4.1a		
	F - total fuel input, higher heating value weighted average	MMBtu	operator (or fuel supplier) measured - higher heating value based on method in section 95125(c)
	e_e - efficiency of electricity generation	Percent	operator determined facility-specific value or default value provided
	e_h - efficiency of thermal energy production	Percent	equipment manufacturer's rating or default value provided

Example 1: Topping Cycle Emissions Distribution (1)

Nameplate generating capacity > 10 MW
 Prime mover: gas turbine
 Combusts 970 million scf of natural gas

Operator uses method 95125(c) to calculate CO₂ emissions using measured heat content.

Records monthly measurements:

- quantity of fuel combusted
- associated higher heating values

Example 1: Topping Cycle Emissions Distribution (2)

CO₂ emissions from combustion are

- calculated and summed for the report year
- then distributed between electricity generation and thermal energy production.

Distributed Emissions—General Procedure: Bottoming Cycle Data

Required Data	Optional data	Units	Data Source
E _{TCO2} - Total direct CO ₂ emissions from the cogeneration system from stationary combustion		MT	operator measured - determine CO ₂ emissions based on fuel quantities and fuel types or CEMS.
H - Total useful thermal output		MMBtu	operator measured
HRSG - output of heat recovery steam generator		MMBtu	operator measured
	HRSG - input steam to steam turbine, if measured	MMBtu	operator measured
H _{ex} - exothermic heat from manufacturing process, if applicable		MMBtu	calculated or operator determined
P _{net} - Power generated		MWh	operator measured

See ARB Guidance, Table 9.4.2

Example 2: Bottoming Cycle Emissions Distribution

- Cement plant
- Combusts coal for cement manufacture
- Combusts natural gas in the duct burner of the heat recovery steam generator (supplemental firing)

Step 6: Contract with a verifier and initiate verification

- Will be provided by third-party consultants and air districts that meet accreditation criteria
- Includes a conflict of interest policy
- ARB will play an oversight role
- Consistent with ISO 14064-3, ISO 14065, and EU practices



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Next Steps

- Examine ARB final regulation and Instructional Guidance
- Attend or monitor reporting tool workshop December 19
- Consult with ARB staff on questions
- Join e-mail list serves on reporting, verification, watch for additional training opportunities



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GHG Mandatory Reporting Website
<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>



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